Augmented Reality in Health Care

Educational Briefing for Non-IT Executives

Executive Summary

Our digital and physical realities have started to merge as technological innovations continue to proliferate, blurring the lines between computers, humans, and the environment. Augmented reality (AR) is one technology that allows digital information to naturally enter our physical reality as an active part of our environment. AR has been researched and developed for years, but it is experiencing a new wave of attention as major technology companies compete to see which can finally deliver on the hype, and the health care industry is a consistent target for AR applications. While overall adoption of AR in health care is still low, a number of intriguing use cases and trials are underway that could lead to new improvements in patient care and cost-cutting measures.

What is AR?

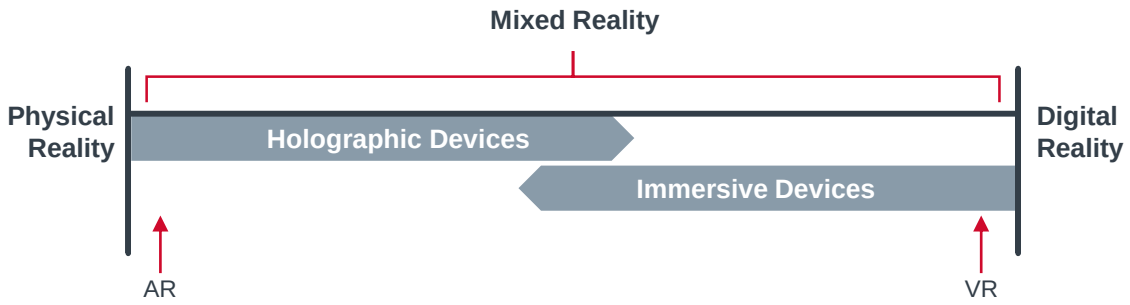
Computer-mediated reality occurs when technology modifies our perception of the real world such as through the use of wearables or hand-held devices. Along the spectrum of mediated reality, there are two main categories: virtual reality (VR) and AR. The primary difference between AR and VR is the level of immersion.

VR technology uses software to generate a three-dimensional (3D), computer-generated environment that is completely immersive to the user. AR technology superimposes computer-generated images, holograms, videos, and sounds over the user's view of the real environment. AR can be used on mobile devices, tablets, glasses, or head-mounted displays (HMDs), and uses sensors, cameras, and projectors to create the illusion of digital objects. AR allows users to interact with and manipulate the digital information they see. Google Glass and Microsoft HoloLens are popular examples of AR products.

AR headsets typically receive input from voice commands, button interfaces, or hand gestures, and many can also record video. While some AR headsets are wireless and contain all of their computing power within the headset itself, others use a computing pack or smartphone to help power the device. AR can be further segmented across the following two categories:

- *Space-agnostic AR* overlays virtual objects in the user's field of view without any spatial relationship to the environment.
- *Space-aware AR* is more advanced, and incorporates virtual objects in the user's field of view that do have spatial relationships with real objects.

The Mixed Reality Spectrum



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Sources: "Mixed Reality," Windows Development Center, Microsoft; Health Care IT Advisor research and analysis.

What is the state of AR adoption in health care?

The high cost of AR systems continues to be a primary barrier for adoption, but increased market competition has started to put pressure on vendors to lower their prices over time. VR has been receiving a bit more attention recently compared to AR, with HMDs like the Oculus Rift and HTC Vive showcasing impressive virtual worlds that have a wide range of applications across education and training, mental health, pain management, and other medical interventions. Nevertheless, AR holds an advantage over VR in the enterprise space because of its ability to let users still see their physical environment around them. However, which technology health care providers use will depend on their use cases. Future AR adoption will depend upon more well-designed, controlled studies that provide evidence that AR is clinically sound and cost effective at scale.

Why is it important?

Although many AR solutions are still in pilot stages or serve distinct niches, AR technology has been in use for many years and has a number of applications across medical research, business operations, and patient care. The last few years have been a period of further discovery for AR, but it will likely take another three to five years before the industry sees the start of substantial enterprise deployments.

The ongoing developments in HMDs, smart glasses, smartphones, and the large investments made by vendors such as Google, Apple, Facebook, and Microsoft have served as a catalyst for greater adoption in the future.

How does AR affect health care providers and IT leaders?

Medical education and training improvements

- Health care providers can use holograms to study the human body, test emerging forms of patient care, or plan for complex surgeries. Patients can also be educated using AR tools.

Patient treatment innovations

- AR offers a range of patient care applications, including guides and virtual monitors for surgeries, digital contact lenses, assistance for the visually-impaired, and improved vein visualization for blood draws or IV placement.

Operational and administrative benefits

- AR opens up new opportunities for interactive conferencing (e.g., visualizing a surgery center design), warehouse management, and improving how clinicians review and handle daily tasks (e.g., pulling up lab notes on smart glasses, having remote scribes document patient encounters through real-time video/audio streams).

Questions That Hospital Executives Should Ask Themselves

1. If we adopt AR technology, what are some specific use cases on which to focus our investment?
2. Do we have an AR project team or champion to guide the planning, procurement, and implementation of large-scale AR initiatives?
3. Are there vendors or academic institutions that are willing to partner with us for early pilots?

Additional Advisory Board research and support available

Report: Augmented Reality in Health Care: Here to Stay or a Passing Fad?

Webconference: The Hospital of the Future

Source: Health Care IT Advisor research and analysis.